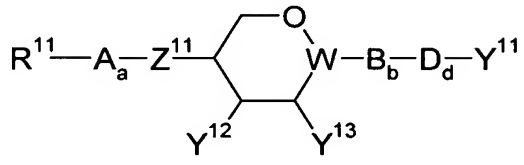
Claims

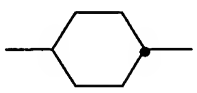
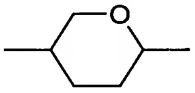
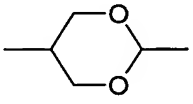
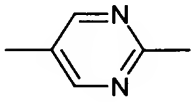
1. Compound of the general formula I



I

in which

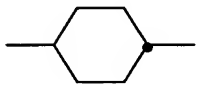
R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or a halogenated or unsubstituted alkyl radical having 1 to 15 carbon atoms, where, in addition, one or more CH_2 groups in this radical may each be replaced, independently of one another, by -C≡C-, -CH=CH-, -O-, -CO-, -CO-O- or -O-CO- in such a way that O atoms are not linked directly to one another;

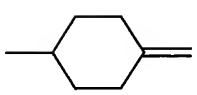
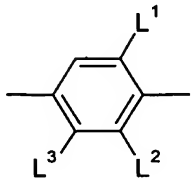
A stands for  ,  ,  or  ;

a is 0, 1 or 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

W denotes >CH- or >C=;

B and D, independently of one another, stand for  ,

 or  ;

b and d, independently of one another, are 0 or 1;

Y^{11} denotes =O, $=C(SR^{12})(SR^{13})$, $=CF_2$, -H, -F, -Cl, -Br, -I, -CN, -OH, -SH, $-CO-R^{14}$, $-OSO_2R^{15}$, $-C(=S^+R^{12})(-SR^{13})X^-$, $-B(OR^{16})(OR^{17})$, $-BF_3^-Cat^+$, $-Si(OR^{18})(OR^{19})(OR^{20})$ or alkyl, where alkyl denotes a halogenated or unsubstituted alkyl radical having 1 to 15 C atoms, in which, in addition, one or more CH_2 groups may each be replaced, independently of one another, by -C≡C-, -CH=CH-, -O-, -CO-, -CO-O- or -O-CO- in such a way that O atoms are not linked directly to one another;

Y^{12} and Y^{13}, independently of one another, denote H or alkyl, where alkyl denotes a halogenated or unsubstituted alkyl radical having 1 to 15 C atoms, in which, in addition, one or more CH_2 groups may each be replaced, independently of one another, by -C≡C-, -CH=CH-, -O-, -CO-, -CO-O- or -O-CO- in such a way that O atoms are not linked directly to one another;

L^1, L^2 and L^3, independently of one another, denote H or F;

R^{12} and R^{13}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or toge-

ther form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms;

R^{14} denotes OH, O-aryl, O-aralkyl, O-alkyl, Cl, Br, aryl, aralkyl or alkyl;

R^{15} denotes aryl, aralkyl or a halogenated or unsubstituted alkyl radical having 1 to 15 carbon atoms, where, in addition, one or more CH_2 groups in this alkyl radical may each be replaced, independently of one another, by -C≡C-, -CH=CH-, -O-, -CO-, -CO-O- or -O-CO- in such a way that O atoms are not linked directly to one another;

R^{16} and R^{17} denote H or an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms;

R^{18}, R^{19} and R^{20}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms;

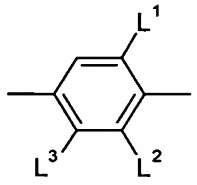
Cat^+ is an alkali metal cation or a quaternary ammonium cation;

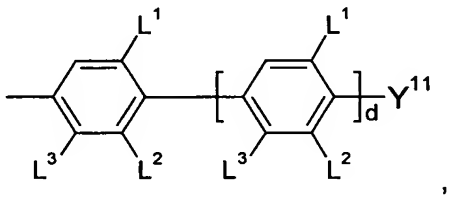
and

X^- is a weakly coordinating anion;

with the proviso

that W denotes >CH- if b+d ≠ 0;

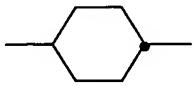
that Y^{11} does not denote =O, $=C(SR^{12})(SR^{13})$ or $=CF_2$ if Y^{11} is connected to B or D =  ;

that Y^{11} denotes -H, -I, -OH, -SH, $-CO_2R^{14}$, $-OSO_2R^{15}$, $-C(=S^+R^{12})(SR^{13})X^-$, $-B(OR^{16})(OR^{17})$, $-BF_3^-Cat^+$, $-Si(OR^{18})(OR^{19})(OR^{20})$ or alkyl, where alkyl denotes a halogenated or unsubstituted alkyl radical having 1 to 15 C atoms, in which one or more CH_2 groups have each been replaced, independently of one another, by -C≡C-, -CH=CH-, -O-, -CO-, -CO-O- or -O-CO- in such a way that O atoms are not linked directly to one another and alkyl does not stand for alkoxy, if W is connected directly to  , where d is 0 or 1;

that B does not stand for  if d = 1; and

that A can adopt identical or different meanings if a is 2.

2. Compound according to Claim 1, characterised in that

A stands for  .

3. Compound according to Claim 1, characterised in that

a is 0.

4. Compound according to any one of Claims 1 to 3, characterised in that
Y^{12} and Y^{13} denote H.

5. Compound according to any one of Claims 1 to 4, characterised in that
Z^{11} represents a single bond, $-CF_2O-$ or $-OCF_2-$.

6. Compound according to any one of Claims 1 to 5, characterised in that
R^{11} denotes an unbranched halogenated or unsubstituted alkyl radical having 1 to 7 carbon atoms.

7. Compound according to any one of Claims 1 to 6, characterised in that
Y^{11} denotes =O, $=C(SR^{12})(SR^{13})$ or $=CF_2$.

8. Compound according to any one of Claims 1 to 6, characterised in that
Y^{11} denotes -H, -F, -Cl, -Br, -I, -OH, $-CO_2H$, $-C(=S^+R^{12})(-SR^{13})X^-$, $-B(OR^{16})(OR^{17})$, $-BF_3^-Cat^+$ or $-Si(OR^{18})(OR^{19})(OR^{20})$.

9. Compound according to any one of Claims 1 to 6 and 8, characterised in that
X^- denotes BF_4^-, $CF_3SO_3^-$, $C_4F_9SO_3^-$, PF_6^-, SbF_6^- or AsF_6^-.

10. Compound according to any one of Claims 1 to 9, characterised in that
b is 0 and d is 0.

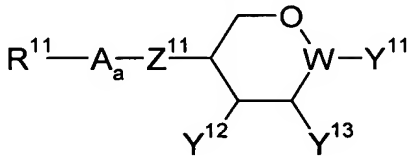
11. Compound according to any one of Claims 1 to 9, characterised in that

b is 1 and d is 0.

12. Compound according to any one of Claims 1 to 9, characterised in that

b is 1 and d is 1.

13. Process for the preparation of a compound of the formula IA

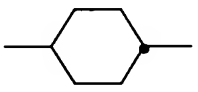
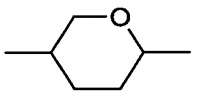
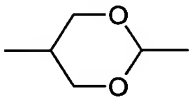
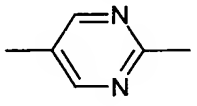


IA

,

in which

R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or alkyl;

A stands for  ,  ,  or  ;

a is 0, 1 or 2, where A can adopt identical or different meanings if a is 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

W denotes >C=;

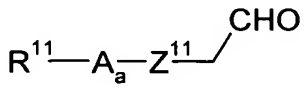
Y^{11} denotes =O, $=C(SR^{12})(SR^{13})$ or $=CF_2$;

Y^{12} and Y^{13}, independently of one another, denote H or alkyl; and

R^{12} and R^{13}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms;

characterised in that

a compound of the formula II

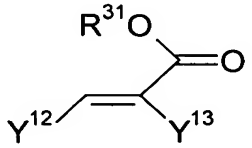


II

in which R^{11}, A, a and Z^{11} are as defined above for the formula IA,

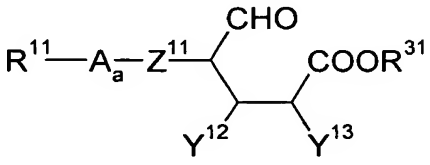
is reacted in a reaction step (A1)

(A1) in the presence of a base with a compound of the formula III



III

in which Y^{12} and Y^{13} are as defined above for the formula IA, and R^{31} denotes an alkyl radical having 1 to 15 carbon atoms, to give a compound of the formula IV

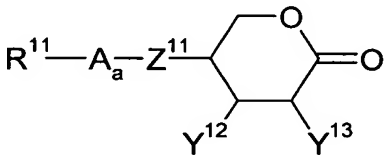


IV

in which R^{11}, A, a, Z^{11}, Y^{12} and Y^{13} are as defined above for the formula IA, and R^{31} is as defined above for the formula III;

and subsequently, in a reaction step (A2),

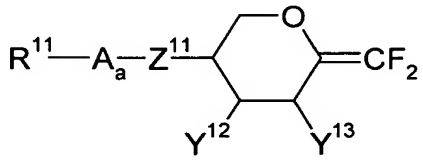
(A2) the compound of the formula IV is converted into the compound IA1



IA1

and optionally, in a reaction step (A3),

(A3) the compound of the formula IA1 is converted into the compound IA2

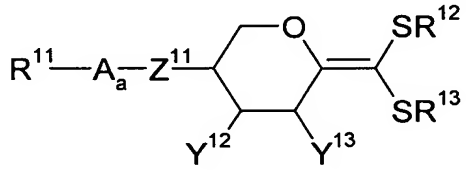


IA2

by reaction with CF_2Br_2 in the presence of $P(N(R^{21})_2)_3$, $P(N(R^{21})_2)_2(OR^{22})$ or $P(N(R^{21})_2)(OR^{22})_2$, where R^{21} and R^{22}, independently of one another, denote an alkyl radical having 1 to 15 carbon atoms;

or optionally, in a reaction step (A3'),

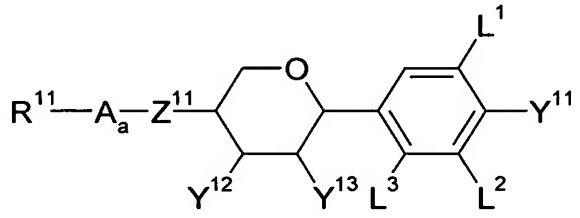
(A3') the compound of the formula IA1 is converted into the compound IA3



IA3

by reaction with $CHG(SR^{12})(SR^{13})$, in which G denotes $P(OCH_2R^{23})_3$, where R^{23} is a perfluorinated alkyl radical having 1 to 5 carbon atoms, or $Si(CH_3)_3$ or $Si(CH_2CH_3)_3$, and R^{12} and R^{13} are as defined above for the formula IA, in the presence of a strong base.

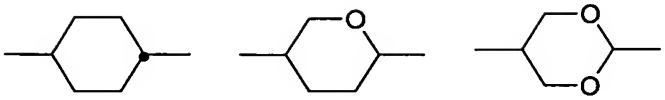
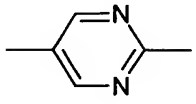
14. Process for the preparation of a compound of the formula IB



IB

in which

R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or alkyl;

A stands for  or  ;

a is 0, 1 or 2, where A can adopt identical or different meanings if a is 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

Y^{11} denotes -H, -F, -Cl, -Br, -I, -CN, -OH or $-B(OR^{16})(OR^{17})$;

Y^{12} and Y^{13}, independently of one another, denote H or alkyl;

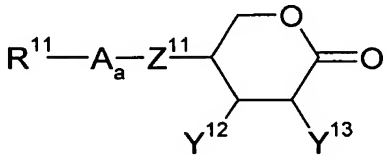
L^1, L^2 and L^3, independently of one another, denote H or F; and

R^{16} and R^{17}, independently of one another, denote H or an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms;

characterised in that,

in a reaction step (B1),

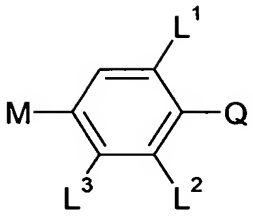
(B1) a compound of the formula IA1



IA1

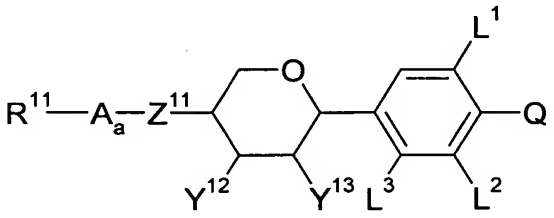
in which R^{11}, A, a, Z^{11}, Y^{12} and Y^{13} are as defined above for the formula IB,

is reacted with a compound of the formula V



V

in which L^1, L^2 and L^3 are as defined above for the formula IB, M denotes Li, Cl-Mg, Br-Mg or I-Mg, and Q denotes H, F, Cl, Br, I or CN, with formation of the compound of the formula IB1



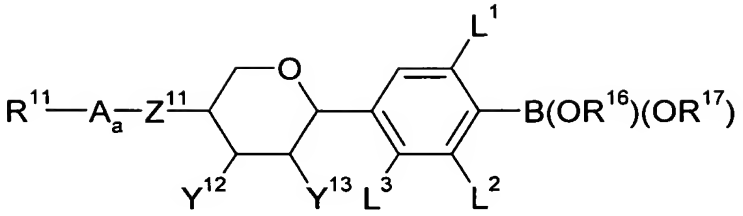
IB1

in which R^{11}, A, a, Z^{11}, Y^{12}, Y^{13}, L^1, L^2 and L^3 are as defined for the formula IB, and Q is as defined for the formula V;

and optionally, in a reaction step (B2),

(B2) the compound of the formula IB1 in which Q denotes Br is reacted with $B(OR^{16})(OR^{17})(OR^{24})$, where R^{16}, R^{17} and R^{24} are an unbranched or branched alkyl radical having 1 to 15 carbon atoms, or with $HB(OR^{16})(OR^{17})$, where R^{16} and R^{17} denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms, in the presence of an alkyllithium base,

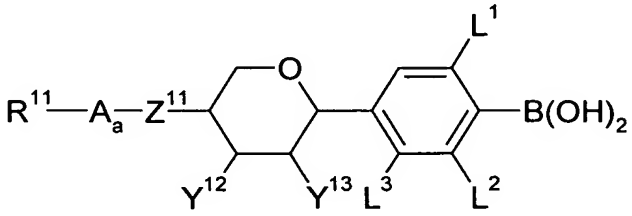
to give the compound of the formula IB2



IB2

and optionally, in a reaction step (B3),

(B3) the compound IB2 is converted into the compound IB3

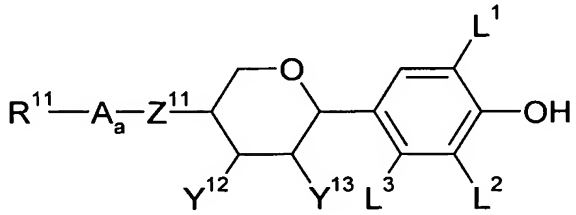


IB3

by reaction with an aqueous acid;

and/or optionally, in a reaction step (B4),

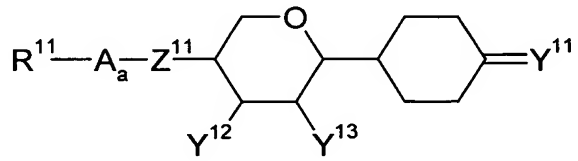
(B4) the compound IB2 or the compound IB3 is converted into the compound IB4



IB4

by reaction with hydrogen peroxide in alkaline or acidic solution.

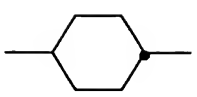
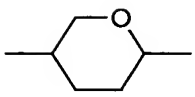
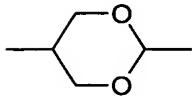
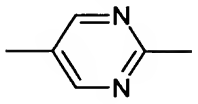
15. Process for the preparation of a compound of the general formula IC



IC

in which

R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or alkyl;

A stands for  ,  ,  or  ;

a is 0, 1 or 2, where A can adopt identical or different meanings if a is 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

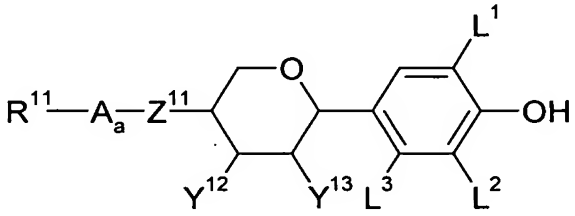
Y^{11} denotes =O, $=C(SR^{12})(SR^{13})$ or $=CF_2$;

Y^{12} and Y^{13}, independently of one another, denote H or alkyl; and

R^{12} and R^{13}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms;

characterised in that, in a reaction step (C1),

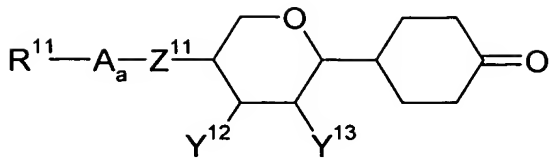
(C1) the compound of the formula IB4



IB4

in which R^{11}, A, a, Z^{11}, Y^{12} and Y^{13} are as defined above for the formula IC, and L^1, L^2 and L^3 denote H,

is converted into the compound IC1

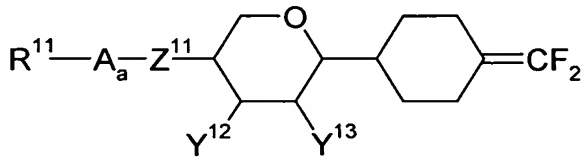


IC1

using hydrogen in the presence of a transition-metal catalyst;

and optionally, in a reaction step (C2),

(C2) the compound IC1 is converted into the compound IC2

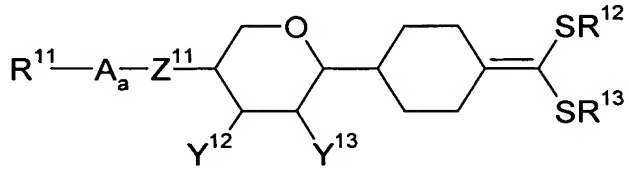


IC2

by reaction with CF_2Br_2 in the presence of $P(N(R^{21})_2)_3$, $P(N(R^{21})_2)_2(OR^{22})$ or $P(N(R^{21})_2)(OR^{22})_2$, where R^{21} and R^{22}, independently of one another, are an alkyl radical having 1 to 15 carbon atoms;

or optionally, in a reaction step (C2'),

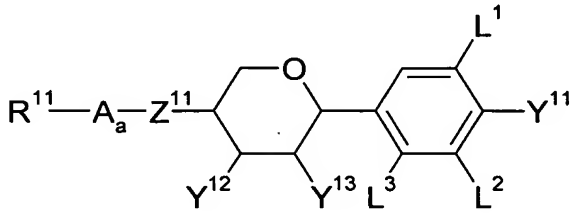
(C2') the compound of the formula IC1 is converted into the compound IC3



IC3

by reaction with $CHG(SR^{12})(SR^{13})$, in which G denotes $P(OCH_2R^{23})_3$, where R^{23} is a perfluorinated alkyl radical having 1 to 5 carbon atoms, or $Si(CH_3)_3$ or $Si(CH_2CH_3)_3$, and R^{12} and R^{13} are as defined above for the formula IC, in the presence of a strong base.

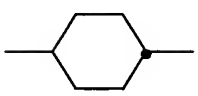
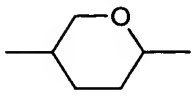
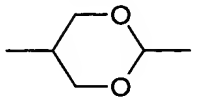
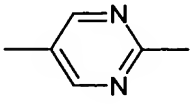
16. Process for the preparation of a compound of the formula ID



ID

in which

R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or alkyl;

A stands for  ,  ,  or  ;

a is 0, 1 or 2, where A can adopt identical or different meanings if a is 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

Y^{11} denotes $-CO_2H$ or $-C(=S^+R^{12})(-SR^{13})X^-$;

Y^{12} and Y^{13}, independently of one another, denote H or alkyl;

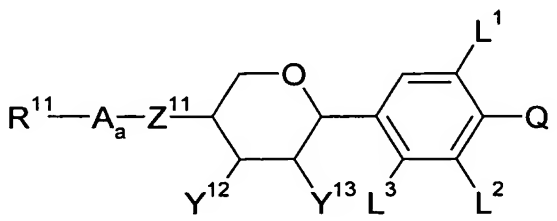
L^1, L^2 and L^3, independently of one another, denote H or F;

R^{12} and R^{13}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms; and

X^- is a weakly coordinating anion;

characterised in that, in a reaction step (D1),

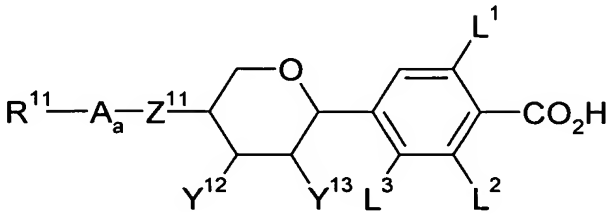
(D1) a compound of the formula IB1



IB1

in which R^{11}, A, a, Z^{11}, Y^{12}, Y^{13}, L^1, L^2 and L^3 are as defined for the formula ID, and Q denotes H or Br,

is reacted with an organometallic base and CO_2 to give the compound ID1

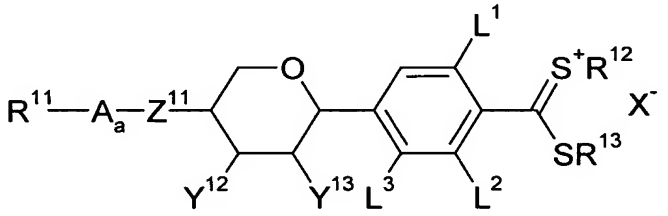


ID1

in which R^{11}, A, a, Z^{11}, Y^{12}, Y^{13}, L^1, L^2 and L^3 are as defined for the formula ID;

and optionally, in a reaction step (D2),

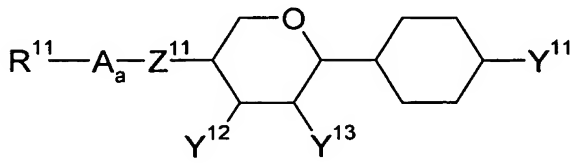
(D2) the compound ID1 is converted into the compound ID2



ID2

in the presence of an acid HX using HSR^{12} and HSR^{13} or using $HSR^{12}R^{13}SH$.

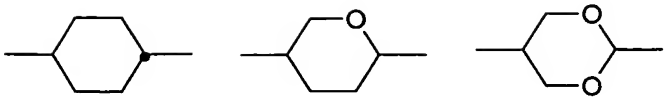
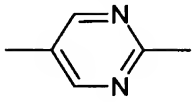
17. Process for the preparation of a compound of the formula IE



IE

in which

R^{11} denotes H, F, Cl, Br, I, CN, aryl, heterocyclyl or alkyl;

A stands for  or  ;

a is 0, 1 or 2, where A can adopt identical or different meanings if a is 2;

Z^{11} represents a single bond, $-CH_2-CH_2-$, $-CF_2-CF_2-$, $-CF_2-CH_2-$, $-CH_2-CF_2-$, $-CH_2-O-$, $-O-CH_2-$, $-CF_2-O-$ or $-O-CF_2-$;

Y^{11} denotes $-CO_2H$ or $-C(=S^+R^{12})(-SR^{13})X^-$;

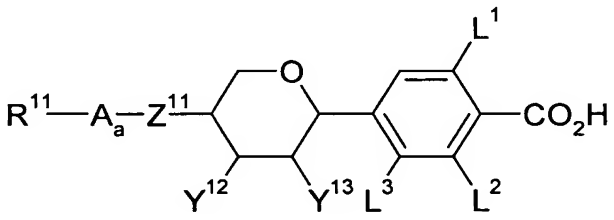
Y^{12} and Y^{13}, independently of one another, denote H or alkyl;

R^{12} and R^{13}, independently of one another, denote an unbranched or branched alkyl radical having 1 to 15 carbon atoms or together form a $-(CH_2)_p-$ unit, where p = 2, 3, 4, 5 or 6, where one, two or three of these CH_2 groups may be substituted by at least one unbranched or branched alkyl radical having 1 to 8 carbon atoms; and

X^- is a weakly coordinating anion;

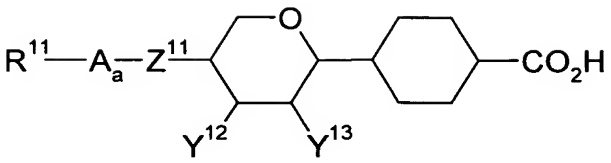
characterised in that, in a reaction step (E1),

(E1) the compound of the formula ID1

 ID1

in which R^{11}, A, a, Z^{11}, Y^{12} and Y^{13} are as defined above for the formula IE, and L^1, L^2 and L^3 denote H,

is converted into the compound IE1

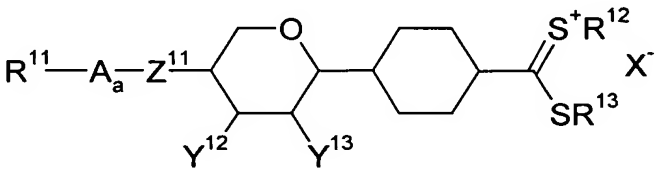


IE1

using hydrogen in the presence of a transition-metal catalyst;

and optionally, in a reaction step (E2),

(E2) the compound of the formula IE1 is converted into the compound IE2



IE2

in the presence of an acid HX using HSR^{12} and HSR^{13} or using $HSR^{12}R^{13}SH$.